



Case Series

Cosmetic and oncological outcome of different oncoplastic techniques in female patients with early central breast cancer

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ABSTRACT

Background: Breast conservative surgery (BCS) was absolutely contraindicated in centrally located breast cancer (CLBC). This study evaluates the short-term oncological and cosmetic outcomes of different oncoplastic procedures after resection of CLBC.

Material and methods: This prospective study includes 40 female patients with CLBC who underwent different oncoplastic techniques and had the Grisotti, Melon slice, Round block, and Batwing mastopexy techniques. Cosmetic outcomes were evaluated by patients and surgeons, in addition to assessing the oncological outcome.

Results: The patients evaluated the postoperative cosmetic result. They were described as excellent in 27 patients (67.5%), good in 11 patients (27.5%), fair in 2 patients (5%) with neither poor nor bad results, with a mean of 4.44 ± 0.6 ($P = 0.002$). In comparison, the surgeons evaluation was 10 points in 8 patients (20%), 9 points in 7 patients (17.5%), 8 points in 12 patients (30%), 7 points in 3 patients (7.5%), 6 points in 7 patients (17.5%), and 5 points in 3 patients (7.5%), with a mean of 7.54 ± 1.52 , ($P = 0.001$).

Conclusions: The Grisotti technique is associated with a better cosmetic result when reconstructing the central defect in moderate-sized breasts. Batwing mastopexy and round block techniques can be used to resect the central tumors with an excellent cosmetic outcome.

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1. Background

The preferred treatment of early-stage breast cancer is a combination of BCS and postoperative radiation therapy with similar survival benefits to mastectomy [1]. The aim of BCS is the complete removal of cancer with adequate surgical margins, with preservation of shape and appearance of the breast. Obtaining both goals together in the same surgery can be challenging [2].

Modified radical mastectomy (MRM) was the treatment of choice for patients with CLBC. CLBC was one of the limitations for BCS because of the direct invasion of the NAC, resulting in cosmetic repulsion due to the possibility of removing the NAC [3]. It is unclear whether patients undergo BCS in a centrally located tumor similar to those who undergo a mastectomy regarding locoregional recurrence, disease-free, or overall survival rates [4,5].

The classic BCS or central quadrantectomy, which includes NAC excision and the underlying glandular tissue down to the pectoralis muscle fascia, may lead to local parenchymal defects and poor cosmetic outcomes including disfigurement of the breast contour and contracture of the scar in most cases [6]. Failure of standard BCS procedures results in the development of new breast surgery methods during the past decade. Oncoplastic surgery (OPS) is a new approach that allows wide local excision (WLE) of the mass without the affection of the contour and shape of the breast [7].

OPS plays an essential role in the treatment of CLBC since it gives a chance for broader safety margins and good oncological results while preserving great cosmetic outcomes and satisfaction [8]. After central quadrantectomy, many OPS techniques can be used to reconstruct the breast. Several factors affect the choice of the OPS technique, such as tumor size, NAC involvement, the volume of the breast, and the degree of breast ptosis [9]. This study aims to assess the short-term oncological and cosmetic outcomes of different OPS techniques after central breast cancer resection.

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2. Patients and methods

This prospective study included 40 female patients with CLBC who were treated at the general surgery department, Benha university hospital from August 2017 to November 2020. Our study has been reported in line with the STROCSS criteria [10]. Registration unique identifying number (UIN):6576 (<https://www.researchregistry.com/browse-the-registry#home/>).

2.1. Inclusion criteria

All patients with early central breast cancer were included in the study. The definition of CLBC is cancer located within 2 cm of the areola [11,12].

2.2. Exclusion criteria

1. Patients with peripheral or eccentric cancer breast (extends more than 2 cm beyond the areolar margin).
2. Multicentric breast cancer.
3. History of breast radiotherapy.
4. Inflammatory breast cancer (IBC)
5. Systemic metastasis
6. Patient's refusal of BCS
7. Pregnancy.

3. Material and methods

After the study's approval by the ethical committee of the Faculty of Medicine, Benha University and after obtaining written informed consent from the patients for participation in the study, the patients were fully informed about the hazards and benefits of the surgery. The patients were evaluated by a multidisciplinary team (including one or more specialized representatives from general surgery, pathology, radiology, radiotherapy, and medical oncology) and patients enrolled in our study if they fulfilled our inclusion criteria. All patients underwent the following: preoperative full detailed history, physical examination of both breasts and axilla was done including assessment of the breast size (cup size), shape, ptosis, previous operations (biopsies, previous surgery) in addition to co-morbidities such as diabetes mellitus and obesity.

Assessment of breast ptosis was done using **LaTrenta and Hoffman Classification** [13]. Investigations including routine laboratory investigations, bilateral ultrasonography and mammography, magnetic resonance image (MRI), and metastatic workup were done. For diagnosis, core needle biopsy was done; patients with suspected Paget's breast (PDB) disease underwent wedge biopsy.

3.1. Assessment of the NAC

Evaluation of NAC is an essential part of the preoperative assessment to detect if NAC is involved or not. NAC complex was excised if any of the following features present: Clinical signs of NAC involvement (retraction of nipple, nipple discharge, ulceration, Paget disease) or radiological findings suggesting malignant involvement of the NAC (distance from the lesion to nipple less than 2 cm, done by MRI).

3.2. The outline of oncoplastic surgical techniques

According to NAC's involvement, size of the breast, and degree of ptosis, we classified the patients into 4 groups (Fig. 1). Patients who required contralateral breast surgery to achieve bilateral symmetry refused to do any contralateral surgery. Also, patients who underwent NAC resection refused to undergo NAC reconstruction.

3.3. Oncoplastic techniques

3.3.1. 1-Grisotti mastopexy

Consists of excision of the central quadrant inferior based comma-shaped flap mobilization, with rounded skin island to fill the defect (Fig. 2 and 3).

3.3.2. 2-Melon slice technique

Consists of horizontal elliptical excision, including NAC, with excision of the tumor with safety margin down to pectoral fascia followed direct closure (Fig. 4).

3.3.3. 3-Round block technique

Consists of 2 circular skin marking, the inner circle is made on the border of the areola, and the outer circle depends on the size and location of the tumor, breast ptosis, and the position of the nipple. De-epithelialization of the tissue between 2 incisions, then

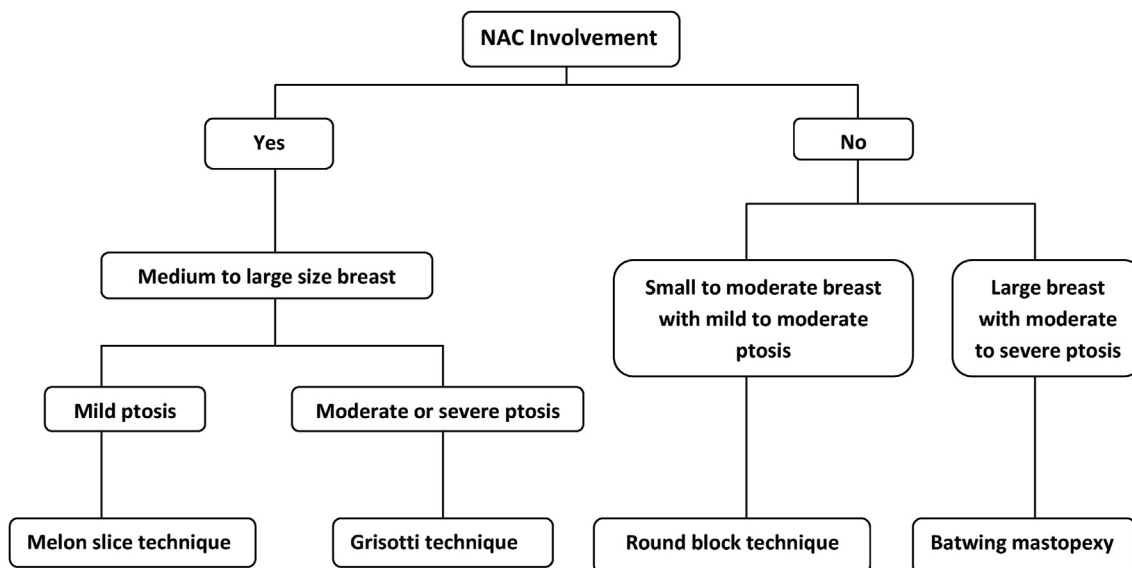


Fig. 1. Outlines of OPS techniques.

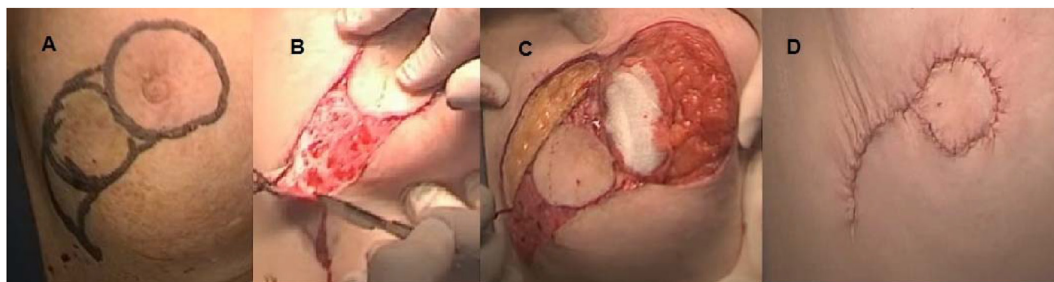


Fig. 2. Grissotti technique (A) preoperative mapping, (B) flapde-epithelialization without new areola, (C) central quadrant defect (D) postoperative view.



Fig. 3. Another patient with Grissotti technique.

excision of the tumor with safety margins down to the pectoral fascia. Skin incisions are closed using a running technique (Fig. 5).

3.3.4. 4-Batwing mastopexy technique

Two semicircular incisions are performed with angled “wings” on each side of the NAC. The 2 half-circles are positioned to allow them to be re-approximated to each other at wound closure. Removal of these skin wings enables the semicircles to be shifted together without creating redundant skin folds at closure (Fig. 6).

3.4. Management of the axilla

Patients who presented with negative lymph nodes (N0) were subjected to sentinel lymph node biopsy (SLNB) at the time of surgery using methylene blue. Combined retro-areolar and peritumoral injection techniques were done. If SLNB was negative, there was no need for axillary lymph node dissection (ANLD). However, if the sentinel node was positive, ALND was done (level I and II dissection). Patients who initially presented with positive axilla were subjected to ALND.

3.5. Pathological evaluation

All excised specimens were oriented and subjected to histopathological and immunohistochemical evaluation, including estrogen receptor (ER), progesterone receptor (PR), Her-2- neu. Margins were considered as negative when permanent histopathological assessment found no cancer cells within 1 mm distance from the excised specimen for invasive breast cancer and 2 mm for ductal carcinoma in situ (DCIS).

3.6. Postoperative follow-up

Postoperative clinical follow-up was done every 3 months for 2 years. It included history and physical examination of both breast and axilla and combined bilateral mammograms and the US if there was any clinical suspicion.

3.7. Endpoints

3.7.1. 1-Primary endpoint

Evaluation of the cosmetic results by the patient and surgeons 6 months after surgery.

Evaluation by patients: By asking the patients to rate the postoperative cosmetic outcome by using a five-point scale [excellent (5), good (4), fair (3), poor (2), bad (1)].

The surgeons' evaluation was done by 2 surgeons based on a visual analog scale from 1 (unacceptable result) to 10 (excellent result). The evaluation was based on 5 criteria: the shape of the breast, the symmetry of the breast, NAC reconstruction, scar shape and/or retraction, and parenchymal tissue defects.

3.7.2. 2-Secondary endpoint

Assessment of oncological outcome during follow-up period.

3.8. Statistical analysis

Data were coded and entered using the statistical package SPSS version 25. Data were summarized using mean, standard deviation, median, minimum, and maximum in quantitative data and using frequency (count) and relative frequency (percentage) for categorical data. Comparisons between quantitative variables were made using the non-parametric Mann-Whitney test. For comparing categorical data, Chi-square (c2) test was performed. The Exact test was used instead when the expected frequency is less than 5. P-values less than 0.05 were considered statistically significant.

4. Results

This study includes 40 patients with CLBC who underwent four oncoplastic techniques. The mean age of the patients was 53.46 ± 8.65 years (range; 37–72). The patients' characteristics are summarized in Table 1.



Fig. 4. Melon slice technique, (A) preoperative mapping, (B) elliptical incision, (C)specimen orientation, (D) tumor bed, (E) approximation of glandular tissue, (F) closure of the skin.

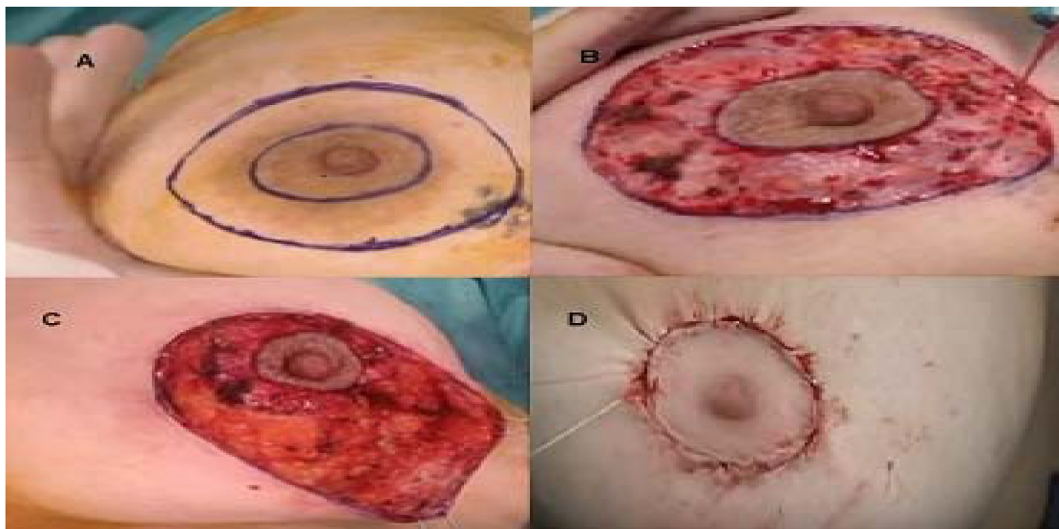


Fig. 5. Round block technique, (A) preoperative mapping, (B) de-epithelialization between 2 circles, (C) Central quadrantectomy defect, (D) postoperative view.

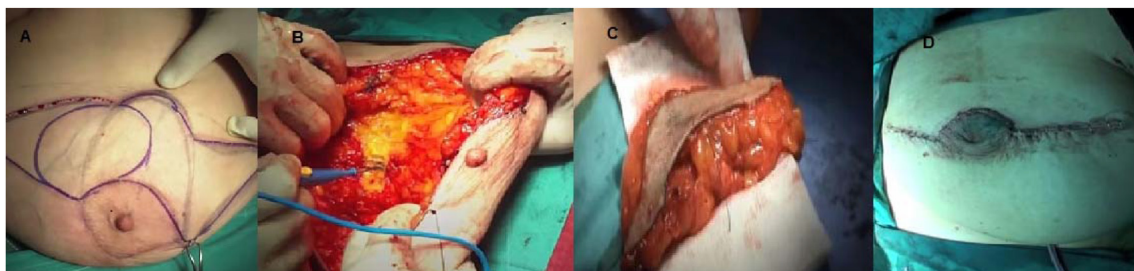


Fig. 6. Batwing mastopexy technique, (A) preoperative mapping, (B) glandular defect, (C) specimen, (D) immediate postoperative view.

4.1. Pathological assessment

The tumor size ranged from 1.6 to 3 cm (mean, 2.4 ± 0.92 cm). Surgical safety margins were negative in all patients with a mean 1.3 ± 0.52 cm and a median of 1.6 cm (range from 0.9 to 2.1 cm). Also, deep margins were negative in all patients since pectoral fascia was resected in all patients. Tumors were staged as pT1 in 8 patients (20%) and pT2 in 32 patients (80%). 29 patients presenting with positive axillary lymph nodes underwent ANLD, and all were staged as pN1. In comparison, the other 11 patients presenting with clinically and/or radiologically negative axilla underwent SLNB, 9 of those patients had positive SNLB and underwent ANLD and staged pN1. In comparison, the other 2 patients had negative SNLB. ER-positive in 33 (82.5%) patients while 31 patients (77.5%) were PR positive and 11 patients (27.5%) were HER2 neu positive. The pathological diagnosis of cancer breast diagnosis is summarized in Table 1.

4.2. Postoperative complications

11 patients (27.5%) developed postoperative complications. 4 patients (10%) developed superficial wound infection and were managed conservatively with antibiotics. All of them were diabetic. 4 patients (10%) developed a hematoma, all were treated conservatively. 3 patients (7.5%) developed seroma all were treated with needle aspiration. Postoperative complications are illustrated in Table 1.

4.3. Cosmetic outcome

4.3.1. A-evaluation by patients and surgeons

The postoperative cosmetic result evaluated by the patients was excellent in **24 patients (60%)**, good in 11 patients (27.5%), fair in **5 patients (12.5%)** with no bad results, with a mean of 4.44 ± 0.6,

Table 1
Demographic data, pathological subtypes and postoperative complications.

Patients characteristics		Grisotti technique (n = 12)	Melon slice technique (n = 8)	Round block technique (n = 11)	Batwing mastopexy technique (n = 9)
Age	Range	42–70	40–71	37–69	43–72
	Mean ± SD	47.73 ± 9.30	55.00 ± 11.05	54.24 ± 12.11	52.32 ± 6.42
Menopausal status, n (%)	Premenopausal	5 (41.7%)	6 (75%)	9 (81.8%)	3 (33.3%)
	Postmenopausal	7 (58.3%)	2 (25%)	2 (18.2%)	6 (66.7%)
Family history of cancer breast, n (%)	Positive	2 (16.7%)	2 (25%)	3 (27.3%)	0 (0.0%)
	Negative	10 (83.3%)	6 (75%)	8 (72.7%)	9 (100%)
NAC involvement before surgery, n (%)	Yes	12 (100%)	8 (100.0%)	0 (0.0%)	0 (0.0%)
	No	0 (0.0%)	0 (0.0%)	11 (100.0%)	9 (100.0%)
NAC involvement after surgery, n (%)	Yes	9 (75%)	5 (62.5%)	0 (0.0%)	0 (0.0%)
	No	3 (25%)	3 (37.5%)	11 (100.0%)	9 (100.0%)
Pathological types, n (%)	IDC	7 (58.3%)	4 (50%)	10 (90.9%)	8 (88.9%)
	PBD	4 (33.3%)	4 (50%)	0 (0.0%)	0 (0.0%)
	DCIS	0 (0.0%)	0 (0.0%)	1 (9.1%)	1 (11.1%)
	ILC	1 (8.3%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Diabetes mellitus (DM), n (%)		1 (8.3%)	0 (0.0%)	3 (25%)	2 (22.2%)
Seroma, n (%)		0 (0.0%)	1 (12.5%)	0 (0.0%)	2 (25%)
Hematoma, n (%)		2 (16.7%)	1 (12.5%)	1 (8.3%)	0 (0.0%)
Wound infection, n (%)		2 (16.7%)	0 (0.0%)	2 (18.2%)	0 (0.0%)

IDC: Invasive Ductal Carcinoma, PBD: Paget Disease of the Breast, DCIS: Ductal Carcinoma Insitue, ILC: Invasive lobular Carcinoma.

Table 2
Assessment of the cosmetic result.

	Evaluation by patients (n = 40) (range, 1–5) (Mean ± SD, 4.44 ± 0.6)			Evaluation by surgeons (n = 40) (range, 5–10) (Mean ± SD, 7.54 ± 1.52)					
	Excellent	Good	Fair	10 point	9 point	8 point	7 point	6 point	5 point
	24 (60%)	11 (27.5%)	5 (12.5%)	8 (20%)	7 (17.5%)	12 (30%)	3 (7.5%)	7 (17.5%)	3 (7.5%)
P value	0.002			0.001					

equivalent to 90% satisfaction (P = 0.002). Evaluation of the postoperative cosmetic outcome by surgeons was 10 points in 8 patients (20%), 9 points in 7 patients (17.5%), 8 points in 12 patients (30%), 7 points in 3 patients (7.5%), 6 points in 7 patients (17.5%), and 5 points in 3 patients (7.5%), with a mean of 7.54 ± 1.52 equal to 76% satisfaction (P = 0.001) [Table 2].

4.3.2. B-grisotti technique versus melon slice technique (Fig. 7)

Patients' evaluation was excellent in 7 patients (58.3%) and good in 5 patients (41.7%) of patients who underwent the Grisotti technique. In contrast, with the Melon slice technique, it was good in 5 patients (62.5%), fair in 3 patients (37.5%), with no reported excellent results (P = 0.013). Evaluation by surgeons was 9 in 3 patients (25%), 8 in 4 patients (33.3%), 7 in one patient (8.3%), and 6 in 5 patients (41.7%) with a mean of 7.19 ± 1.38 in Grisotti technique, while it was 7 in one patient (12.5%), 6 in 3 patients (37.5%) and 5 in 4 patients (50%) with a mean of 5.480 ± 0.76 in Melon slice technique. Patients who underwent Grisotti technique showed significantly better cosmetic results than patients who underwent the Melon slice technique.

4.3.3. C-round block technique versus batwing mastopexy (Fig. 8)

Patients' evaluation was excellent in 9 patients (81.8%) and good in 2 patients (18.2%) who underwent round block technique. In contrast, in the Batwing mastopexy technique, it was excellent in 8 patients (88.9%) and good in 1 patient (11.1%), with no reported fair results (P = 0.274). Evaluation by surgeons was 10 in 2 patients (18.2%), 9 in 3 patients (27.3%), 8 in 4 patients (36.4%), 7 in one patient (9.1%) and 6 in one patient (9.1%) with a mean of 8.32 ± 1.04 in round block technique, while it was 10 in 4 patients (44.4%) 9 in 2 patients (22.2%), 8 in 2 patients (22.2%) and 7 in one patient (11.1%) with a mean 8.87 ± 1.12 in Batwing mastopexy technique. There was no significant difference in the patients' cosmetic outcome or by the surgeon between both techniques.



Fig. 7. Postoperative views (A) Grisotti technique, (B) Melon slice technique.



Fig. 8. Postoperative views (A) Round block technique (B) Batwing mastopexy.

4.4. Oncological outcome

All patients received adjuvant therapy. Forty patients (100%) received whole breast radiotherapy (WBRT), which started 4 weeks after surgery except 4 patients (10%) who developed wound infection, radiation therapy started 6–8 weeks postoperatively. 33 patients (82.5) and 34 patients (57.5%) received adjuvant hormonal therapy and chemotherapy, respectively. Adjuvant chemotherapy and hormonal therapy started 6–8 weeks after surgery. There is no effect of radiotherapy on cosmetic result. There is no evidence of local recurrence or distant metastasis during the follow-up period, ranging from 8 to 24 months (mean 16.72 ± 5.27 months).

5. Discussion

The traditional conservative treatment for CLBC was central quadrantectomy. This procedure involves the excision of the NAC and the corresponding part of the underlying breast parenchyma down to the pectoralis fascia, which may lead to local glandular defects and poor cosmetic results such as distortion of the contour of the breast and scar contracture in a majority of cases. The development of OPS techniques, which includes volume displacement or replacement techniques, the central glandular defect, can be restored with excellent cosmetic outcomes [8,12].

The choice of OPS technique depends on the anatomical location of the lump and features of the breast, extent of lump resection, previous operation, and the patient's expectations and wishes. However, a 'good surgical hand' in OPS techniques is not the only factor required to optimize the cosmetic and oncological outcomes. There are several factors that should be in the mind of the oncoplastic surgeon to achieve a better result, such as careful preoperative local staging of the tumor, multidisciplinary team discussion (Surgical Board) to choose the ideal technique suitable for the patient, use of intraoperative ultrasonography (IOUS) as a guide for resection, combined radiological and pathological evaluation of specimen intraoperatively for better definition of the mass and resection margins in addition to the frozen section which should be done for all six faces of the resected specimen, shaving of the circumferential tumor cavity systematically to have a backup to resection margins and decrease the rate of positive margins, palpation with IOUS of the remaining breast to rule out any other neoplastic foci, placement of clips at the resection site as a landmark to guide adjuvant radiation therapy and proper pathological evaluation of the specimen using macrosections [14].

In our study, the mean age was 53 years, Park et al., reported that the patients' mean age is 49 years. Another study by Naguib reported a mean age of 48 years. The patients' age in the current study is close and comparable to both studies [12,15].

The mean diameter of the mass in our study was 2.4 ± 0.92 cm, which is close to that reported by Moustafa et al. and Naguib being 2.9 ± 0.95 cm and 1.69 ± 0.86 cm, respectively [15,16]. IDC was the most common pathological subtype of breast cancer in this study (71.4%). Similar results have been documented by Gardfjel et al., Farouk et al., and Park et al., which showed an incidence of IDC 78.4, 68.5%, and 80%, respectively [6,12,17].

In this study, NAC infiltration was found in 50% of cases who underwent excision of the NAC, which is higher than what has been reported by Naguib [9 out of 23 patients (39.1%)] [15]. This may be because; he depends only on clinical assessment of NAC invasion. In our study, we assessed NAC involvement clinically and/or radiologically.

In our study, patients' cosmetic outcome was evaluated as excellent in 27 patients (67.5%), good in 11 patients (27.5%). Our results are similar to those reported by Farouk et al. (excellent in 70% and good in 20% of patients) and Kijima et al. (excellent in

62.5% and good in 37.5% of patients) [6,18]. In contrast, the study reported by Moustafa et al. showed less aesthetic outcome, being excellent in only 30% and good in 55% of his patients, which can be elucidated by the high rate of flap-related complications in the case series (25%). Another reason is that 90% of his cases underwent excision of the NAC compared to 50% in our study, which affects the overall cosmetic outcome [16]. Shechter et al., evaluate the cosmetic outcome, and patient satisfaction in 24 patients who underwent OPS, and BCS divided into 2 groups (12 in each group) and revealed that the immediate OPS approach in the management of CLBC with NAC resection has clear advantages over BCS alone, and this option should be considered for and offered to suitable patients [19].

In the current study, the mean overall surgeons' satisfaction was 76%. Satisfaction reported by surgeons was lower than that reported by the patients, which is 90%. This difference in satisfaction between surgeons and patients was reported by Moustafa et al. (patient satisfaction 80% and surgeon satisfaction 72%) and Adimulam et al. (patient satisfaction 96% and surgeon satisfaction 88%) [16,20]. A reasonable explanation for this is that patients with breast cancer have an initial fear of losing their breast, hence their simple preservation satisfaction. In contrast, Tauschet al., reported that the mean score for aesthetic outcome was 1.5 for patients and 1.7 for surgeons [21].

Patients with preserved NAC group had significantly better cosmetic outcomes than those who underwent excision of the NAC (85% versus 40, respectively). This can be explained by all patients considering the absence of NAC as a defect in the overall aesthetic outcome despite their refusal to reconstruct NAC.

In the current study, the Grisotti technique was associated with excellent cosmetic outcomes and a high patient satisfaction level. Similarly, studies reported by Della Rovere et al., Masetti et al., Moustafa et al., and Naguib revealed excellent cosmetic results and a high level of patient satisfaction with the Grisotti technique [15,16,22,23]. Batwing mastopexy and Round block technique showed excellent results in (88.9%) and (81.8%) of patients, respectively. Similarly, studies reported by Matkowski et al, Masetti et al., and Anderson et al. showed excellent cosmetic outcomes with both techniques [23–25]. This can be explained by the relatively non-visible circum-areolar scar related to both methods.

All patients who underwent excision of the NAC refused to undergo reconstruction of NAC. Even though it is a simple technique, this result was documented in other studies. This denotes that preserving the breast shape and contour for a feminine body is the most important requirement for females. Furthermore, all patients refused to undergo contralateral breast surgery for symmetry because they feared bilateral scarring and disfigurement. Other reasons for refusal were that patients were exhausted from previous surgery, radiation therapy, and chemotherapy. As so, they were unwilling to go through another disputable surgical procedure when offered as a delayed option; this is similar to that reported by other studies [6,15,16].

In this study, no evidence of loco-regional or distant recurrence was reported during the follow-up period (24 months). Other studies that investigated the oncological safety of BCS in CLBCs reported no statistically significant variation in loco-regional, systemic recurrence, and overall free survival between BCS and mastectomy [4,5,26].

A limitation of our study is the relatively small number of cases, which may be explained by the rarity of CLBCs compared to the other quadrants, in addition to the short follow-up period (24 months).

Finally, different oncoplastic techniques can be applied in patients with CLBCs with reasonable aesthetic outcomes. Proper patient selection evaluation and assessment are the most crucial

aspect to guide decision-making regarding the best approach that leads to better cosmetic results without affection of the oncological safety margins and outcomes.

6. Conclusion

Several oncoplastic techniques can be safely used to reconstruct the central quadrant after resection of CLBC with reasonable cosmetic outcomes. Based on previous data, we recommend such techniques in patients with early central breast cancer.

Ethical approval

Current study approved by the ethical committee of the Faculty of Medicine, Benha University.

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Author contribution

Mohamed S Essa: Study conception, design, data interpretation, literature review and writing.

Mohamed E Zayed: Acquisition, analysis and interpretation of data.

Ahmed M.F. Salama: Acquisition of data and literature review.

Khaled S Ahmad: Critical revision of manuscript.

Conflict of interest statement

There is no conflict of interest to disclose.

Guarantor

The corresponding author is the guarantor of submission.

Registration of research studies

Trial registration (UIN):researchregistry6576.

Consent

Written informed consent was obtained from the patient for publication of this study and accompanying images.

Availability of data and materials

The datasets used and/or analyzed during the current study available from the corresponding author on reasonable request.

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Not applicable.

List of abbreviations

MRM	Modified Radical Mastectomy
BCS	Breast Conservative Surgery
NAC	Nipple Areola Complex
OPS	Oncoplastic Surgery
WLE	Wide Local Excision
MRI	Magnetic Resonance Image
SLNB	Sentinal Lymph Node Biopsy
ALND	AxillaryLymphNode Dissection

DM	Diabetes Mellitus
PROMs	Patient-Reported Outcome Measures
WBRT	Whole Breast Radiotherapy
IDC	Invasive DuctalCarcinoma
DCIS	Ductal Carcinoma In Situ
PDB	Paget Disease of the Breast
ILC	Invasive Lobular Carcinoma
ER	Estrogen Receptor
PR	Progesterone Receptor
IOUS	Intraoperative Ultrasonography

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijso.2021.100336>.

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